

it is true, as they remark, that compared with that of many other industries the chemistry of the oils, fats, and waxes is remarkable for its simplicity; but unless the reader has already had some grounding in organic chemistry he will probably conclude, from the pages of formulæ put before him in the earlier part of the work, that it is not such a very simple matter after all.

This apart, the book is a serviceable one for the purpose in view. Practical analytical work is left to be expounded in a companion treatise: the present volume explains the chemical processes and terms used in connection with the fixed oils and their congeners, and gives the physical and chemical data characterising the various products; but it is not intended to be a guide and counsellor for the experimenter. For example, the meaning of "viscosity" is shown, and the values of this constant are given, but detailed directions for actually determining the viscosity are not included; presumably these are reserved for the companion volume.

The interpretation of analytical data, not the way to obtain them, is the key-note of the book. A large amount of information is given in a systematic manner and in a very handy form. The diagrammatic representations of chemical and physical constants are a special feature, which should prove convenient for speedily identifying an unknown oil or fat—in fact, the present writer has already found them useful. C. S.

INCREASE OF AGRICULTURAL OUTPUT.

(1) *British Grasses and their Employment in Agriculture.* By S. F. Armstrong. Pp. vii+199. (Cambridge: At the University Press, 1917.) Price 6s. net.

(2) *Manuring for Higher Crop Production.* By Dr. E. J. Russell. Second edition. Pp. vi+94. (Cambridge: At the University Press, 1917.) Price 3s. 6d. net.

(1) THE task of increasing home-grown food-supplies has steadily forced itself to the front as one of the key-problems upon the solution of which the issue of the war primarily depends. The essential features of the problem are by this time familiar even to the lay public, in so far, at any rate, as they involve the ploughing up of grassland and the planting of corn or potatoes. It is not sufficiently realised, however, even by the farmer himself, that this represents only one part of the contribution which can be effectively made to the desired increase of food production. The total agricultural area of the United Kingdom is roughly forty-seven million acres, of which some twenty-seven million acres are under permanent grass, whilst of the remaining area about six and a half million acres rank temporarily as grassland, being occupied at the moment by rotation grasses and clovers, forming a transition crop in the arable rotation. It is obvious that the utmost efforts in bringing land under the plough can make only relatively small inroads upon this immense acreage of grassland, so that we must continue to depend upon grassland for a very substantial contribution

to national food supplies. Moreover, in proportion as the area of arable land increases and that of grassland shrinks, the greater becomes the necessity for devoting attention to the improvement of the latter, in order that adequate grazing for livestock may be provided by the reduced area.

It requires little acquaintance with farming to realise that a great deal of the existing grassland is of very inferior quality, and it is common knowledge amongst agriculturists that a large proportion of it could be considerably improved. Mr. Armstrong estimates that fully 20 per cent., or not fewer than 5,000,000 acres, of so-called grassland is so infested with weeds and inferior grasses as to represent comparatively worthless herbage. What this means in terms of food production is illustrated by estimates submitted to the British Association in 1915 by Mr. T. H. Middleton, which showed that poor grazing land as it exists to-day produces less than one-fifth of the meat obtainable from the same area of average pasture and little more than one-tenth of the produce of the best grassland.

The improvement of poor grassland must proceed along two broad lines. The first requirement is the establishment of healthy soil conditions by means of drainage, liming, and manuring, and only when these have been secured can the other half of the problem, the establishment of a herbage of the more nutritious grasses and forage plants, be successfully dealt with. A knowledge of the characteristics of the different forage plants and their relation to varying soil conditions is obviously an essential part of the improver's equipment. The subject, for which Mr. Armstrong uses the unattractive name of "Agricultural Agrobiology," has received a considerable share of the attention of the agricultural botanist, and Mr. Armstrong has now endeavoured to present it in a form adapted primarily for the agricultural student, but not too technical to be of use to the practical farmer, the seed merchant, and the rural schoolmaster. The major portion of the book is concerned with the botanical characteristics of the various species of grasses, special attention being devoted to those species which are most abundant or of greatest economic importance in the British Isles. The treatment of this part of the subject in the main follows conventional lines, but prominence is given to points that have a special interest for the student of agriculture.

The latter portion of the book deals with the practical problems presented by the grasses in farm economy. The agricultural value of grasses, the valuation of grass-seeds, and the compounding of seed-mixtures receive adequate treatment, whilst a final chapter on the general treatment of grassland gives a brief summary of existing information on a subject which demands much further investigation.

(2) In the improvement of grassland, as in the increase of production on arable land, manuring plays a part of vital importance, and it is in the highest degree desirable that the farmer at this juncture should receive trustworthy guidance in the effective use of manures for all his crops. For

such guidance one looks to Rothamsted, and the rapidity with which a second edition of Dr. Russell's little treatise on manuring has been called for is the best evidence of the success with which he has discharged his obligation. In the briefest compass he gives the clearest possible guidance to the practice of manuring, illustrated throughout by what is probably the most complete summary extant of the results of manurial experiments carried out in this country. The previous edition has been considerably amplified and a very brief chapter added on the breaking up of grassland.

SIR CLEMENTS MARKHAM.

The Life of Sir Clements R. Markham, K.C.B., F.R.S. By Admiral Sir A. H. Markham. Pp. xi+384. (London: John Murray, 1917.) Price 15s. net.

IT is not often that the story of a notable life is told by a biographer who is at once sympathetic and impartial. Admiral Sir Albert Markham, the author of the work under review, is not merely closely related to the subject of the memoir, but was his warm and constant friend. Yet he tells his story with the straight simplicity which seems specially to distinguish naval writers, and he leaves his readers to form their own conclusions. Therein lies the greatest charm of the book, for we can well construct for ourselves from the incidents of a life overflowing with energy and achievement the character of a man who enriched the world by many of those "footprints on the sands of time" which serve as indications and guides in the path of generations to come.

The opening chapters of the book are devoted to the career of young Clements whilst he served as cadet and midshipman in the Royal Navy. Incidentally, there is much interesting history of the gradual extension of our geographical knowledge of the Pacific towards the end of last century, and a very clear conception is given of life in a wooden-sided sailing-ship of the latest and smartest class which preceded the introduction of steam, just about the time when steam was beginning to assert a preponderating influence on naval construction. All this is told with the loving interest of a blue-water sailor, and it is easy to gather from the story how the foundations were then laid of that deep admiration and reverence for the Royal Navy which towards the end of Sir Clements Markham's career amounted almost to infatuation. In the sailor boy, too, we can mark the germs of the mature character of the man. Full of generous impulse, which landed him now and then in serious difficulty (as when he rushed headlong, without even the preliminary knock at the door, into the sacred precincts of his captain's cabin to protest against the flogging of a man who had been twice convicted of drunkenness), he finally decided to forsake a career of adventure which he really loved for the prosaic prospects of a life on land, because of a mistaken notion that discipline and fair play could not be reconciled. His persistent adherence to that decision, from which no persuasions of his family and many friends could shake him, was quite characteristic

of his subsequent attitude in circumstances which occurred not infrequently when his opinions on more important matters were questioned by those who worked with him in the interests of scientific geography. The word "obstinate" has occasionally been whispered of him; but it is not always easy to say where the line is to be drawn between the firmness which may be essential to the successful issue of an important scheme and the unyielding attitude of the autocrat.

Undoubtedly Sir Clements was able, by reason of his determination and his forceful character, to carry through schemes for exploration in regions of the world where no economic gain could be expected in return for great expenditure, and the whole object of research was purely scientific, which would never have matured in the hands of a more feeble advocate. There are some thrilling accounts of Arctic adventure in the book, which is, perhaps, most interesting in these earlier chapters devoted to the moulding of the Markham character.

The author succeeds in carrying our sympathies with his subject from his earliest years of adventure in the fields of exploration and literature (the young Clements wrote a book on astronomy and physical geography at the age of thirteen!) until the pitiful tragedy of his death occurred, without ever drawing on any idealistic resources of his own. Full justice is done to the noble qualities of the man. His warm-hearted enthusiasm for the supremacy of his country in the wide field of exploration, and his devotion to historical and geographical literature which resulted in the publication of much valuable information which might otherwise have been lost to the world, are easily to be gathered from the pages of this biography. His kindly nature (which won him hosts of friends), his ready assistance to those who wanted it; his life-long interest in all that might benefit humanity, which included the acquisition for England of that life-giving remedy for tropical fevers, cinchona, after a difficult and perhaps dangerous quest for the seeds and plants in Peru—all these things combined to illustrate a character which is perhaps unique in these days, and fully deserves the permanent record which has been so ably rendered by Admiral Sir Albert Markham.

As a rule, biographies written by relatives are accepted with a certain amount of justifiable suspicion. There need be no such suspicion in this case. No one who had the privilege of friendship with the subject of these memoirs will say that there is a word too much of uncalled-for adulation. It is a fair record all through and a most interesting story.

T. H. H.

OUR BOOKSHELF.

Food Poisoning. By Edwin O. Jordan. Pp. viii+115. (Chicago, Ill.: University of Chicago Press; London: Cambridge University Press, 1917.) Price 1 dollar or 4s. net.

This little book gives an excellent summary of the subject of food poisoning. It is not within its scope to consider those cases in which definite poisonous substances are added to food with